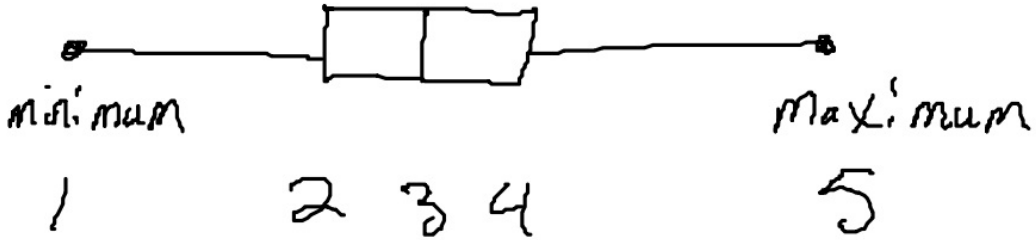
2.1 Measures of Central Tendency and Box Plots



Σ

Ch. 2.1 Example A

Backpack Weights		
10	9	8
20	10	7
9	9	4
17	7	4
3	4	8
10	6	33
15	7	10
15	9	9
7	13	7
10	10	16

Sort smallest to largest

3	3	1
	4	
	4	3
12	4	
6	6	1
	7	
	7	
35	7	5
	7	
	7	
16	8	2
	8	
	9	
27	9	5
	9	
	9	
18	9	
	9	
	10	
	10	
60	10	6
	10	
	10	
	10	
13	13	1
30	15	2
	15	
33	16	1
	17	
53	20	1
	33	1

Mode	10
Median	9
Mean	10.2
n	30
Σ	306

$\bar{x}$ median

Min Q1 ~~Mean~~ Q3 Max

3, ~~6.6~~, ~~10.2~~, ~~13.8~~, 33

7 9 10

Five Number Summary

Quartiles

$\frac{7+7}{2} = 7$

$Q1 \quad \frac{99}{15} = 6.6$

$Q3 \quad \frac{207}{15} = 13.8$

{ , , }

→ L_1

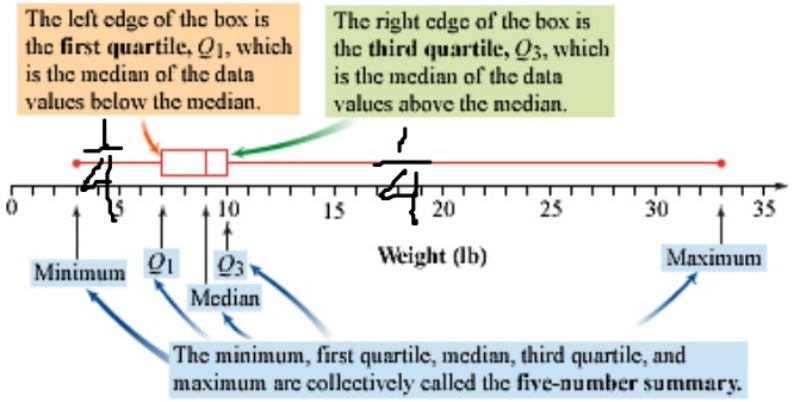
Calculator Notes 1G 2B

Example B

Min Q1 Median Q3 Max

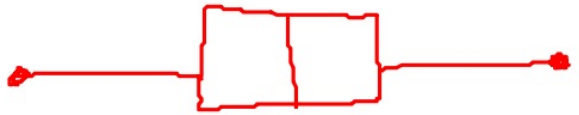
3, 7, 9, 10, 33

R = 30, IQR = 3

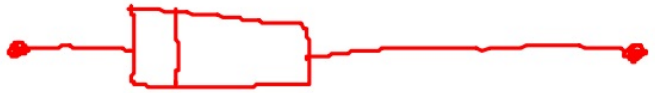


Range = Max − Min

IQR (Inter-Quartile Range) = $Q_3 - Q_1$



symmetrical



skewed right

skewed left

HW pp. 81-82 # 1- 5, 9

2) $\bar{X} = 12$ d

median $= 14$ d

$n = 3$

b) F 14 T

a) $\Sigma = ?$ $\quad \bar{X} = \frac{\Sigma}{n}$ $\quad 3 \cdot 12 = \frac{\Sigma}{3}$

$F + T + 14 = 36$ $\quad 36 = \Sigma$

$F + T = 22$

$F < 14$ 7 6 2 −7

$T > 14$ 15 16 20 29

$F \leq 7$

$T \geq 15$

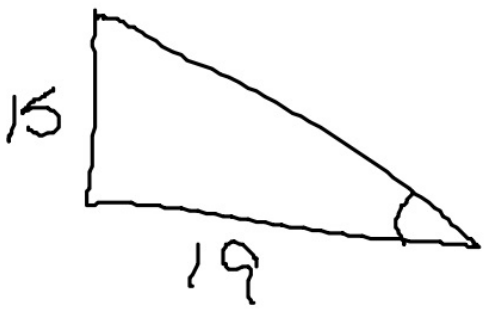
$\frac{\Sigma}{n} = \bar{x}$ $\frac{42}{n} = 7$ $n = 6$

~~$\frac{31}{n} = 6.869$~~

$\frac{31}{5} = \bar{x}$

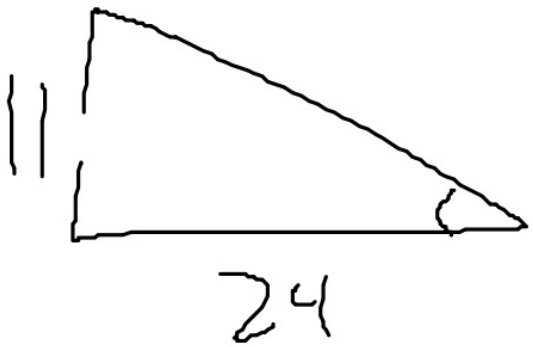
$\frac{\Sigma}{5} = 7.4$

How wide the data is distributed.



$\sin(\theta) = \frac{15}{19}$ 52.1°

$\sin^{-1}(15/19) = 52.1^\circ$



$\sin^{-1}(11/24) = 27.3^\circ$

	X_i	$X_i - \bar{X}$	$(X_i - \bar{X})^2$		X_i	$X_i - \bar{X}$
1	77	48.9	2391.21	32.49	33	-5.7
2	40	11.9	141.61	745.29	46	27.3
3	47	18.9	357.21	299.29	56	17.3
4	19	-9.1	9.1	75.69	30	-8.7
5	15	-13.1	171.61	127.69	50	11.3
6	23	-5.1	26.01	596.49	63	24.3
7	23	-5.1	26.01	161.29	26	-12.7
8	24	-4.1	16.81	1521.29	1	-37.7
9	1	-27.1	27.1	592.89	62	23.3
10	12	-16.1	259.21	497.69	0	-38.7
			3425.88	5494.5		

$$\bar{X} = \frac{\Sigma}{n} = \frac{281}{10}$$

$$\bar{X} = 28.1$$

$$X_i - \bar{X} = \text{deviation}$$

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

1/28 & 1/31

$$\frac{\sum}{n} = \bar{x}$$

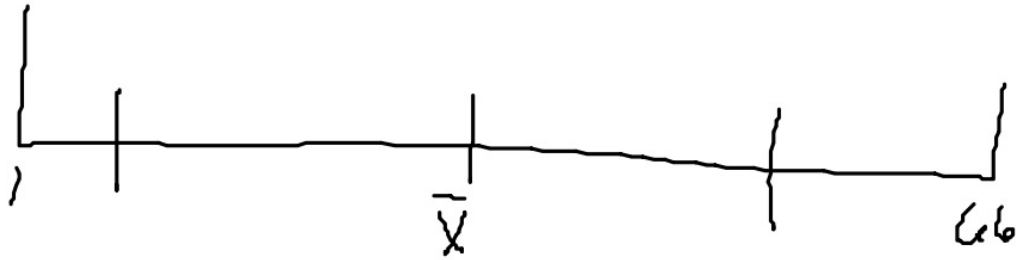
$$\sqrt{\frac{5494.5}{9}} = \sqrt{610.5}$$

deviation $= x_i - \bar{x}$

$$s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

$s = 24.7$

$s = 19.5$



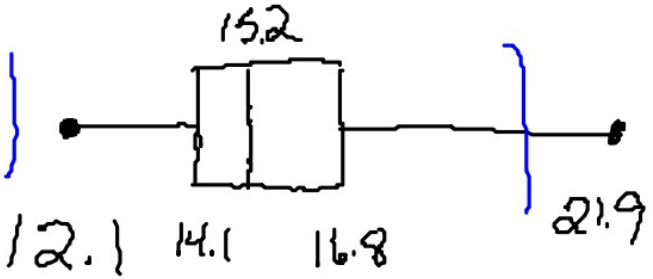
2/3

Ex. $\bar{x} = 15.63$

$s_x = 2.18$

min, Q_1, med, Q_3, max

12.1, 14.1, 15.2, 16.8, 21.9



14 17

12.1, 12.5, 12.5 20.6, 21.9

Outliers — data points that vary significantly from most of the data

15.2 $\quad$ 15.2

$+ 4.4 \quad - 4.4$

19.6 $\quad$ 10.8

2 std. dev. 19.7, 19.8, 20.6, 21.9

pp. 90-91

#1-4, 6

$X_i - \bar{X} =$ deviation

X_1 41 − 47 = −6 36

X_2 55 − 47 = 8 64

X_3 48 − 47 = 1 1

X_4 44 − 47 = −3 9

110

$s = \sqrt{\frac{110}{3}} = 6.1$ $\frac{110}{3}$

$$s = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \bar{X})^2}{n-1}}$$

deviations

Square the deviations

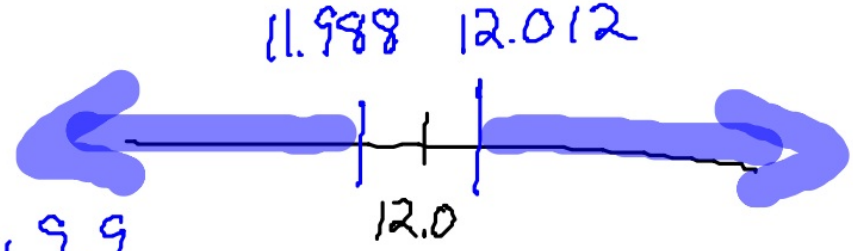
Sum the deviations^2

Divide by 1 less than # of items

SQRT quotient

$\bar{x} = 12.0$ cm

$s = 0.012$ cm



$$12.000 - 0.012 = 11.988$$

$$12.000 + 0.012 = 12.012$$

Range = max − min

$IQR = Q_3 - Q_1$

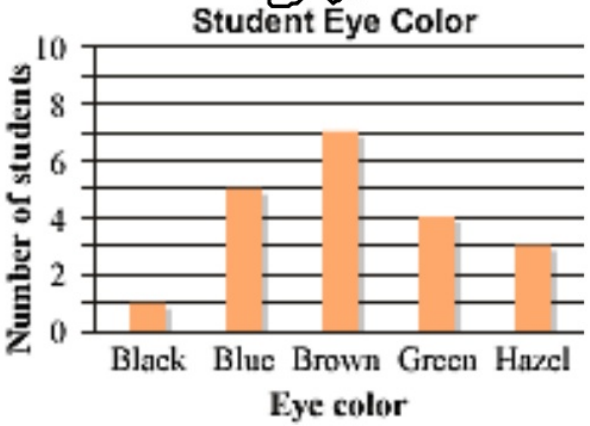
~~22~~, ~~30~~, ~~27~~, 35, ~~32~~, ~~28~~, ~~18~~, ~~22~~, ~~25~~, ~~30~~, 28

18, 22, 22, 25, 27, 28, 28, 30, 30, 32, 35

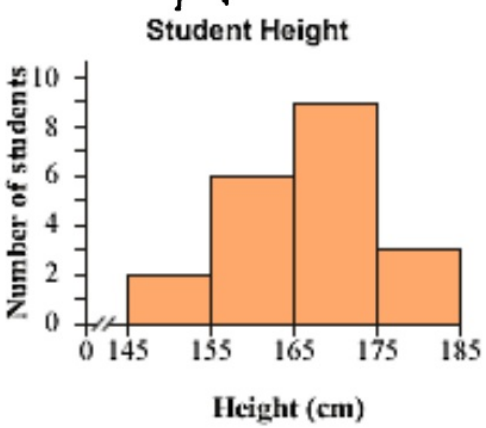
18, 22, 28, 30, 35

Units = (g)

BG



H



histogram

up + down

bins

bins usually together

height represents number of items

tells us about one item

needs numbers you can measure

bar graph

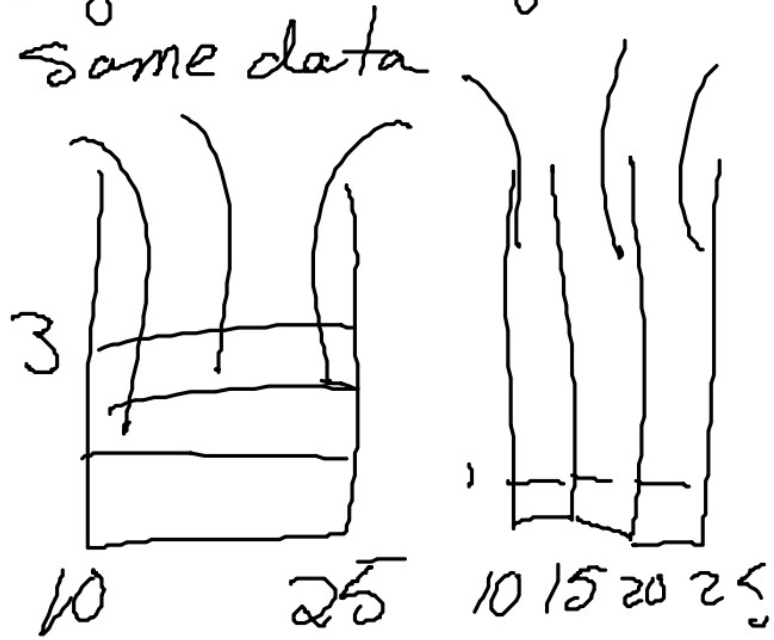
up + down

sideways

bars are separate

Ex A

both have
gaps
tall bins on left
single bins on right
same data



different
# of bins
height of bins
bigger gaps between bins
more gaps
different widths (skinnier)

Ex A

a) range = max − min A $85-25=60$

B $85-27.5=57.5$

b) bin width A 5

B 2.5

d) add all bin heights together

e) small bin width means each bin holds fewer items

i) < 35% $\frac{10}{25}=0.4=40\%$

Percentile Rank – how many items rank below our location

Ft. Collins, CO $\frac{10 \text{ below Ft C}}{25 \text{ all}}$ 40^{TH} percentile

Laredo, TX $\frac{16}{25}$ 64^{TH} 2/9

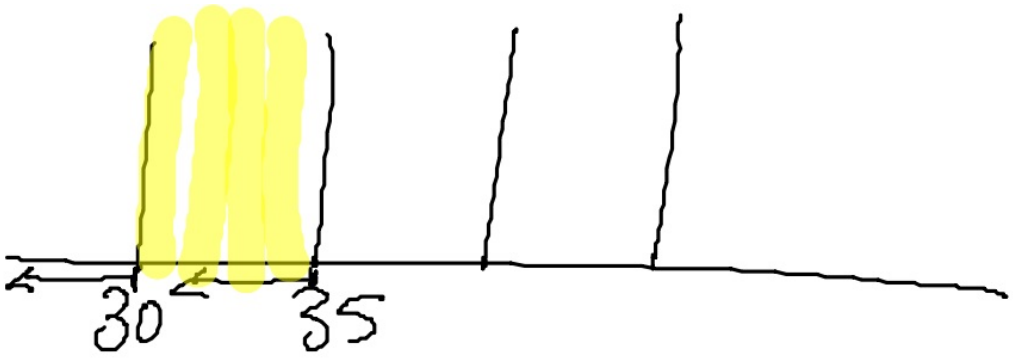
Yuma, AZ $\frac{22}{25}$ 88^{TH}

Ocala, FL $\frac{7}{25}$ 28^{TH}

Denver, CO $\frac{2}{25}$ 8^{TH}

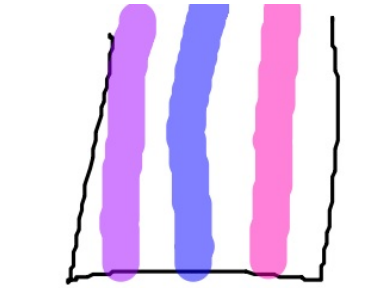
Las Vegas, NV $\frac{24}{25}$ 96^{TH}

Dallas, TX $\frac{0}{25}$ 0^{TH}

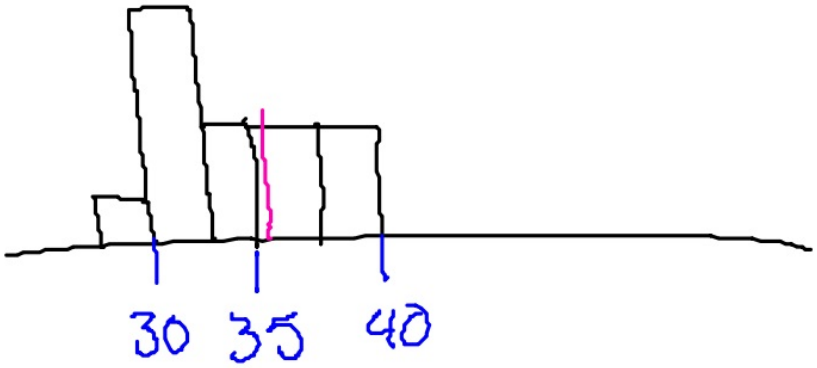


30

30.0000 1



f.c.



Ex B $\bar{X} = 34.05$

$s = 14.68$

$\frac{\Sigma}{n} = \bar{X}$

mean

$s = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}}$

$\bar{X} + 2.5$

$X_i \quad \bar{X}$

$34.05 + 2(14.68) = 63.41$

$\text{Percentile} = \frac{\text{below item}}{\text{Total items}} = \frac{37}{40} = 0.93$

93^{RD}

$\bar{X} = 34.05$

$s = 14.68$

$\bar{X} + s = 48.73$

$\bar{X} - s = 19.37$

19.37 48.73

20 50

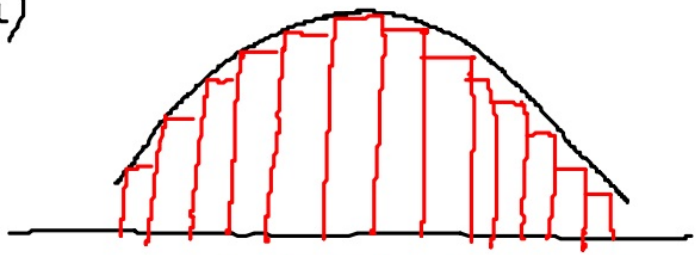
$$\frac{20 \Rightarrow 50}{\text{total}} = \frac{28}{40} = 0.70$$

70%

pp. 100 - 103

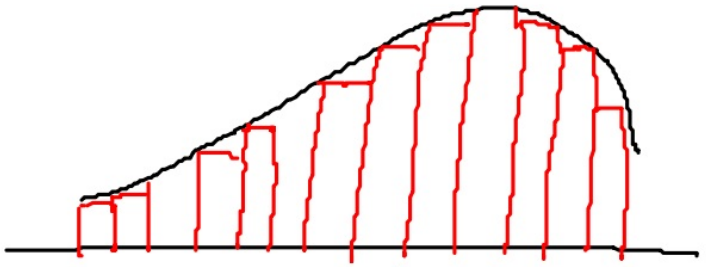
1, 2, 3, 6, 7, 8

(a)



Test scores

b)

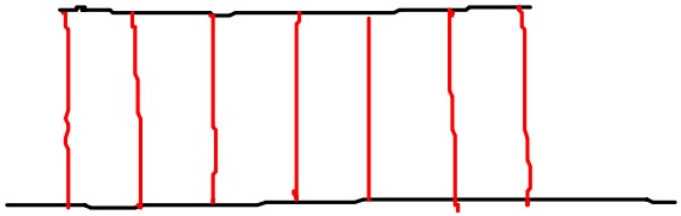


Heights of 4TH grade

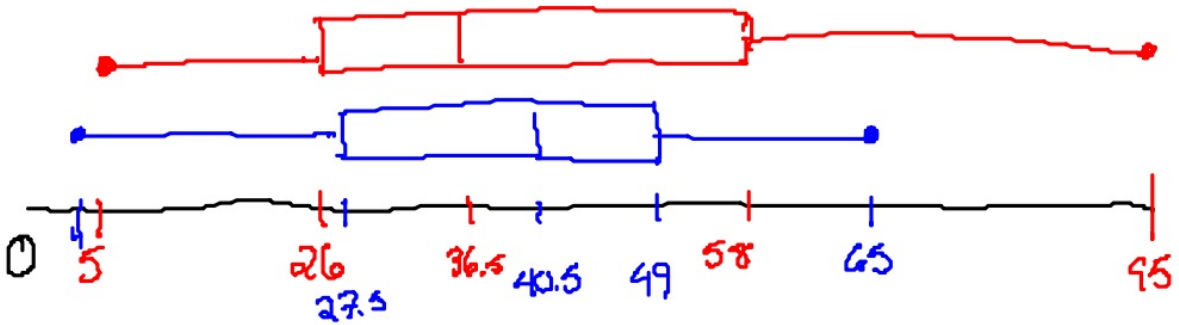
c)

Drinks people take

d)



Number rolled on a die



TV
HW

$S =$

$\overline{X} =$

IQR = 32

IQR = 21.5

$\overline{X} =$

$S =$

1 $x_i - \bar{x}$

2 $(\quad)^2$

3 $\sum_{i=1}^{n}$

4 $n-1$

5 $\sqrt{\quad}$

standard deviation: s

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

range = max − min

percentile rank = $\frac{\#\text{ below item}}{\text{total items } (n)}$

{ , , , } $\xrightarrow[\text{STO}\blacktriangleright]{}$ L_1

STAT CALC 1: Single Variable ENTER

1-VS → L_1 ENTER

⋮

$S_x =$

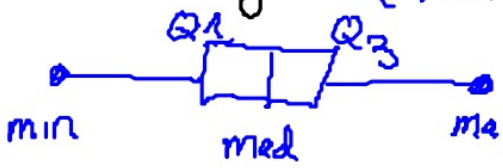
$\bar{X} = \frac{\Sigma}{n}$

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

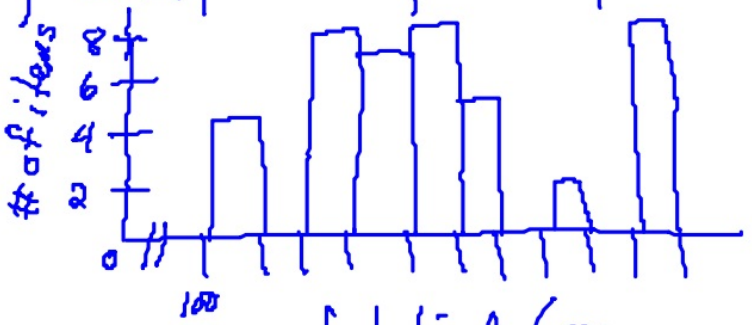
Ch. 2 Review pp. 108-109 #1-5

5 number summary (min, Q1, med, Q3, max)

box plots



histograms



what kind (measurements)
all same width

percentile rank $\frac{\#\text{ below item}}{\text{Total items}}$

range max − min

IQR $Q_3 - Q_1$

standard deviation (s)

median (middle from an ordered list)

mean ($\bar{x}$) $\frac{\Sigma}{n}$ (average)

within one standard deviation of the mean